

CLAIMS

1. A lithographic projection apparatus comprising:
 - a radiation system to supply a projection beam of radiation;
 - a support structure to supporting patterning structure which can be used to pattern the projection beam according to a desired pattern;
 - a substrate table to hold a substrate; and
 - a projection system to project the patterned beam onto a target portion of the substrate, said projection system having a focal plane and comprising at least one adjustable optical element capable of changing the shape of the focal plane;
 - a controller, operative during an exposure to image the irradiated portion, to control said adjustable element to change the shape of said focal plane to improve conformity to the surface contour of said exposure area.
2. Apparatus according to claim 1 wherein said controller comprises a memory to store data representative of said surface contour.
3. Apparatus according to claim 2 wherein said apparatus further comprises a measurement station having a substrate height measurement device operative in advance of an exposure to measure the substrate surface contour of at least one exposure area, for storage in said memory.
4. Apparatus according to claim 2 wherein said a controller further comprises an interface to receive data representative of said surface contour from an external device.
5. Apparatus according to claim 2 wherein said controller is operative to calculate desired adjustments to said adjustable element for a given exposure in advance of that exposure.
6. Apparatus according to claim 1 wherein said apparatus further comprises a sensor to measure the position of the substrate surface at a plurality of points in said exposure area during an exposure.

7. Apparatus according to claim 1 further comprising an actuator to move said second object table to position the substrate at at least one of a desired position and a desired orientation and wherein said controller is also operative to control said actuator to position the substrate.
8. Apparatus according to claim 7 wherein said controller is adapted to control said actuator to effect low order corrections to bring the surface of said substrate at said exposure area into closer conformity with said focal plane and to control said adjustable element to effect high order corrections.
9. Apparatus according to claim 8 wherein said low order corrections comprise position and orientation corrections.
10. Apparatus according to claim 8 wherein said controller is adapted to control said positioning system to effect low order corrections to compensate for low order effects caused by adjustments of said adjustable element.
11. Apparatus according to claim 1 wherein said adjustable element is a field-curvature correction lens.
12. Apparatus according to claim 1 wherein said adjustable element is a piezoelectric actuator to change the shape of a reflector.
13. A device manufacturing method comprising
projecting a patterned beam of radiation onto a target portion of a layer of radiation-sensitive material on a substrate; and
controlling an adjustable element of a projection system used for the projecting, during said projecting, to change the shape of said focal plane to improve conformity to a surface contour of said target portion.
14. A method according to claim 13 further comprising measuring the surface contour of said target portion in advance of the projecting.
15. A method according to claim 14 wherein said measuring is performed using at least one of a measurement station in the lithographic apparatus and a separate qualification tool.

16. A method according to claim 14 further comprising calculating adjustments to the adjustable element in advance of projecting onto a particular target portion.
17. A method according to claim 16 wherein a plurality of similar target portions are imaged and adjustments calculated in said calculating are used in imaging a plurality of target portions.
18. A device manufactured according to the method of claim 13.

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